

# Preserving Threatened and Endangered Species



*“A civilization able to envision God and to embark on the colonization of space will surely find the way to save the integrity of this planet and the magnificent life it harbors.”*

—Edward O. Wilson

The national parks are treasure houses of our rich natural heritage. Every year, wonderful new discoveries of organisms not previously known to science add to already sizable species lists and increase the value of these sanctuaries as places to study, reflect upon, and interpret the diversity of life. Yet among this richness is a small minority of species that are at risk. Threatened and endangered species are plants and animals that require special attention, and in 2004 the National Park Service took action to help secure their future in the national parks. The evolving success stories reported in this chapter include a record number of Kemp’s ridley sea turtles at Padre Island National Seashore, restoration of freshwater mussels at Big South Fork National River and Recreation Area, local expansion of sensitive joint vetch at Colonial National Historical Park, the recovery of piping plovers at Great Lakes parks, and a thriving wolf population in Yellowstone that is having effects throughout that ecosystem. Some of the successes are simply the result of research and reintroduction. In most instances, however, threatened and endangered species require constant attention because of particular challenges: habitat fragmentation, competition with invasive species, poaching, limited genetic diversity, and disease. As demonstrated by many of the articles, actions to recover these species in national parks are increasingly being taken with partners, including federal agencies, state governments, and private landowners.

# Endangered species in national parks

By Peter A. Dratch

**MORE POPULATIONS OF THREATENED AND ENDANGERED** species in the national parks made progress toward recovery in 2004 than ever before (see table 1). The varied management activities that led to this success have become more complex and now include not only species and habitat restoration, but also sociological studies of visitor attitudes and new agreements with a variety of state and federal agencies.

Improving the management of federally listed species depends foremost on identifying where these species occur. Over the last five years the number of populations of listed species that parks have recognized as presently or historically occurring within their boundaries has more than doubled, from 442 to 1,042 (see table 2). The next challenge for parks and the Endangered Species Program is to work closely with the NPS Inventory and Monitoring program to assess the status of those species' populations where it is still unknown.

Wolves from the Yellowstone population are now established in Grand Teton National Park (Wyoming) and surrounding lands. A sociological study of attitudes toward wolves was recently completed in the park. Conducted under an agreement with Colorado State University, this human-dimensions research identified a difference in attitudes toward lethal control of wolves among visitors to the park and residents of the area. As the population requirements for delisting the wolf in the northern Rocky Mountains have been met, and as some management responsibilities for wolves are likely to be transferred from the federal government to the states, a memorandum of understanding between the NPS Intermountain Region and the State of Wyoming has been signed to facilitate sharing information on wolves.

While parks provide habitat for a diverse range of protected species, plants make up the largest group (table 3) and are increasing as the focus of restoration efforts. Along these lines, the endangered Mauna Loa silversword at Hawaii Volcanoes National Park has made momentous progress in 2004. Research on the plant's habitat needs has helped increase the survival rate of transplanted individuals to more than 83% for the 9,400 seedlings that had been transplanted by the end of 2004. According to park Chief of Resource Management Tim Tunison, resource managers at the park "find the best micro-sites, those with the deep soil," for transplanting the greenhouse-raised seedlings. The park also has acquired the Kahuku Ranch, site of one of the three remaining wild silversword populations. This native silversword remnant was saved when one of the ranch workers fenced the area to keep out introduced mouflon sheep. Tunison is excited about the Kahuku acquisition, remarking that the naturally occurring silversword population there is "a fantastic genetic resource." Its presence will enable park staff to genetically diversify greenhouse stock and attempt species restoration over a wider range of habitats.

**TABLE 1**

Population trends of federally listed, proposed, and candidate species in the National Park System for 2003 and 2004

Status Trend in National Parks	Number of Populations		Percentage of Populations	
	2003	2004	2003	2004
Not at risk	82	103	7.2	8.6
Stable	225	286	19.9	23.9
Increasing	93	88	8.2	7.3
Declining	101	91	8.9	7.6
Extirpated	204	206	18.0	17.4
Unknown	402	424	35.5	35.4

**TABLE 2**

Species and populations in the National Park System managed under provisions of the Endangered Species Act

Status	Number of Species	Number of Populations
Endangered	266	613
Threatened	111	460
Experimental	9	13
Proposed	4	6
Candidate	67	97
Total	466*	1,198*

\*When different populations of a species have a different status category, they are counted twice under number of species and number of populations (e.g., green sea turtle is both threatened and endangered; gray wolf is both endangered and experimental).

**TABLE 3**

Endangered, threatened, proposed, and candidate species in the National Park System by group

Group	Number of Species
Plants	243
Mammals	54
Birds	65
Reptiles	20
Amphibians	7
Fish	43
Invertebrates	65

**TABLE 4**

Federally listed, proposed, and candidate species in each region of the National Park System, and the park within each region with the most of those species

Region (Parks)	Number of Species
Alaska (Kenai Fjords National Park)	7
Intermountain (Capitol Reef National Park)	88
Midwest (Indiana Dunes National Seashore)	30
National Capital (C&O Canal National Historical Park, Prince William Forest Park, and Rock Creek Park)	8
Northeast (Gateway National Recreation Area)	27
Pacific West (Haleakala National Park)	245
Southeast (Everglades National Park)	120

## Orchids: Indicators of healthy ecosystems

By Bruce Rittenhouse

Several federally listed bat populations are more secure as a result of habitat protection efforts during the year. At Buffalo National River (Arkansas), park staff posted sensors to monitor cave airflow to benefit three endangered bat species. In California, matching funds from the Cooperative Conservation Initiative paid for the installation of bat “gates” in abandoned-mine openings at Death Valley and Joshua Tree National Parks and Whiskeytown National Recreation Area. The new structures allow bats to continue to use the openings as habitat but keep people out (see article, page 66).

Every action in a park that could affect a federally listed species requires consultation with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, the regulatory agencies responsible for species recovery under the Endangered Species Act. Streamlining the consultation process without sacrificing its effectiveness in protecting species has been a government priority. Regulations passed in December 2003 proposed alternative consultation procedures, particularly for National Fire Plan projects. Data collected by the NPS Endangered Species Program from the fire management officers recorded 204 prescribed burns in national parks over the past two years that required consultation. However, an alternative consultation agreement was proposed to expedite this process for parks in which personnel have been trained to determine whether park actions to reduce fire fuels are unlikely to adversely affect federally listed species. A half-day course in proactive consultation is now available for parks that want to use the new streamlined process.

Endangered species are not evenly distributed across the National Park System (table 4), and the Pacific West Region, with so many listed species, has also been the region with some high-profile recovery efforts. One is this year’s limited release of the captive-bred island fox back into its native habitat at Channel Islands National Park (California). In 2004 the island fox on three of the park islands was listed as endangered. Its sharp decline was caused by predation from golden eagles that had probably been drawn to the islands by feral pigs. In 1999 the park initiated a fox captive-breeding program, and the following year began to live-capture and relocate golden eagles and later to reintroduce the historical bird of prey on the islands, the bald eagle. Working with the U.S. Fish and Wildlife Service, The Nature Conservancy, the California Department of Fish and Game, and other species experts, the park has begun releasing foxes from the captive-breeding facilities on the islands, and is moving forward on feral pig removal from Santa Cruz Island. ■

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**ORCHIDS, WITH AS MANY AS 35,000 SPECIES**, comprise approximately one tenth of the world’s flowering plants. Though their greatest diversity occurs in the tropics, they are found worldwide in a wide range of habitats, including arctic tundra. In the National Park System, orchids number approximately 200 species occurring in 145 units. These park sites range from Noatak National Preserve, north of the Arctic Circle, Alaska, with 1 orchid species, to Everglades National Park, Florida, which has the greatest number of species, 42. Ironically, Hawaii, though tropical, has only 3 native orchid species while Alaska has 29. National parks in the Appalachian Mountains and upper Midwest exhibit a high diversity of orchid species. Summer coralroot (*Corallorrhiza maculata*), known from 43 parks, occurs in the most national parks.

Orchids have adapted several biological strategies unique to the plant kingdom. For example, their seeds lack nutritive materials and cannot successfully germinate naturally without a fungal host. Following germination, orchid seedlings maintain contact with a fungus for successful establishment. This strategy allows them to persist in less than ideal habitats, such as tropical forest canopies and nutrient-poor soils.

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This group of plants has also evolved several intricate and deceptive pollination systems. For example, the pink lady’s-slipper (*Cypripedium acaule*), which occurs in 32 national parks in eastern North America, is pollinated by the bumblebee. Lured into the flower by its color and scent, the bee becomes trapped and must first deposit pollen on the stigma before it can pick up more pollen, escape, and repeat the process in other flowers.

Some orchid species use the strategy of prolonged dormancy and do not produce any aboveground tissue for a year or more. The threatened small whorled pogonia (*Isotria medeoloides*) is able to remain dormant for two or more growing seasons. Reasons for this adaptation are not well understood but may be related to specific environmental conditions or previous reproduction success. This strategy allows orchids to survive periods of nonoptimal environmental conditions such as drought.

Four orchid species occurring in national parks are listed under the Endangered Species Act. Small whorled pogonia is known from Prince William Forest Park (Virginia) and Blue Ridge Parkway (Virginia and North Carolina). Hawaii bog orchid (*Platanthera holochila*) occurs at Haleakala National Park. Ute ladies’-tresses



Small whorled pogonia (*Isotria medeoloides*) is a federally listed threatened orchid species that occurs at Prince William Forest Park, Virginia, and Blue Ridge Parkway, Virginia and North Carolina. Its preservation in these parks depends in part on protecting the habitat that supports it and not disclosing its locations.



Round-leaf orchid (*Amerorchis rotundifolia*) occurs in the northeastern and upper midwestern states, including Voyageurs and Isle Royale National Parks. Like many orchids, this species experiences periods of prolonged dormancy to conserve resources in nonoptimal growing conditions.



Mountain lady's-slipper (*Cypripedium montanum*) inhabits the mountainous regions along the West Coast and northern Rocky Mountains, including Glacier and Yosemite National Parks. This species apparently responds favorably to prescribed fires.

(*Spiranthes diluvialis*) is known from Dinosaur National Monument (Colorado and Utah), Lake Roosevelt National Recreation Area (Washington), and historically Capitol Reef National Park (Utah). Western prairie fringed orchid (*Platanthera praeclara*) occurs at Pipestone National Monument (Minnesota).

The National Park Service is working under a cooperative agreement with the Center for Plant Conservation (CPC) to collect seeds for all federally listed plant species in national parks, including the four listed orchid species. Participating botanical gardens and arboreums are beginning to work with parks where listed plant species occur to collect seeds under sampling guidelines developed by botanists to ensure that a genetic representation of the species is gathered. These seeds will be stored at the National Center for Genetic Resources Preservation in Fort Collins, Colorado. The objective of this project is to store these seeds for potential reintroduction or augmentation of populations to help achieve future recovery goals. The project began in 2004 and will continue through 2006.

Dinosaur National Monument recently mapped the geomorphic resources along the Green River to determine the relationship between high water discharges from Flaming Gorge Dam and the distribution of the threatened Ute ladies'-tresses in the monument. Surveys indicate a strong correlation between the floodplain and the orchid's presence. Results from this project were used for an environmental impact statement to establish times and patterns for future discharges of dam water to protect endangered fish, which would also improve habitat for the orchid.

Though they are not the dominant vegetative component in most areas, orchids can give managers information on whether an ecosystem is healthy and functioning. This is because many species in North America require stable habitat conditions and are sensitive to human-caused disturbances. Conversely, certain natural disturbances such as fire may benefit some orchid species. Because of this sensitivity, orchids may be viewed as the "canary in the coal mine," that is, indicators of healthy, functioning ecosystems, and would be good candidates as ecological vital signs for resource monitoring. Their survival or death following a disturbance may indicate whether certain disturbances are within the range of natural conditions or require management intervention. ■

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## Sensitive joint vetch rediscovered at Colonial National Historical Park

By Charles D. Rafkind and Betsie Blumberg



Jamestown Island, part of Colonial National Historical Park (Virginia), is the site of the first permanent English colony in North America. The 400th anniversary of the founding of Jamestown will be celebrated in 2007. Among other preparations for the anniversary, the park has initiated a series of natural resource inventories with different partners. The Virginia Division of Natural Heritage, under a cooperative agreement, resurveyed the area for rare, threatened, and endangered plants and animals to ensure that construction and renovation activities to be undertaken for the celebration on and around Jamestown Island will not impact these species.

The first find, actually a rediscovery, was of sensitive joint vetch (*Aeschynomene virginica*), an annual, bushy member of the Fabaceae (legume) family endemic to mid-Atlantic tidal wetlands (photo above). The plant was last observed in the park in 1938. In 2000, approximately 15 plants were found near the 1938 site. Sensitive joint vetch is rare throughout its range and is currently on the federal list of threatened species. The Virginia Natural Heritage program ranks the species as very rare and imperiled both statewide and globally.

As of 2004 the plant appears to be thriving. To protect sensitive joint vetch during construction activities for the Jamestown 2007 celebration, the park partnered with the Virginia Institute of Marine Science. The institute's Dr. James Perry and a summer intern observed more than 100 plants in June 2004 (photo right); by September they counted more than 200. The population expansion may be



due to two seasons of unusually high rainfall, which reduced the salinity of the water. The park is considering experimenting with methods to enhance sensitive joint vetch habitat and to increase its chances to thrive and expand. Future research may include clearing away early-season vegetation that shades the late-blooming vetch, and planting its seed to expand the area where it grows. The park has also moved the path of a proposed boardwalk away from the vetch habitat, and it is being monitored to ensure that celebration activities do not harm this survivor. ■

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## Big South Fork restores endangered mussels

By Steve Bakaletz and Dick Neves

**THE RECOVERY OF FIVE FEDERALLY ENDANGERED** mussel species in the Big South Fork of the Cumberland River in north-central Tennessee and southeastern Kentucky is being implemented through the propagation of juveniles. An environmental assessment for recovery of these mussel species was completed in fall 2003, endorsing augmentation and reintroduction of federally listed species as the preferred conservation action. The river is currently home to 26 mussel species, including the endangered Cumberland elktoe (*Alasmidonta atropurpurea*), Cumberland combshell (*Epioblasma brevidens*), Cumberland bean (*Villosa trabalis*), tan riffleshell (*Epioblasma f. walkeri*), and littlewing pearlymussel (*Pegias fabula*). Because of damming and other impacts, the Big South Fork remains the last stronghold for these species within the Cumberland River system, and is of national significance to the conservation of mussel resources in the United States.

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### *Artificial propagation can dramatically increase the successful recruitment of juveniles into the populations.*

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A cadre of partners representing federal agencies and state natural resource departments teamed up with the Freshwater Mollusk Conservation Center at Virginia Tech to augment resident endangered mussel populations and to plan for the restoration of species now extirpated from the park. Historical collection records document 55 mussel species that once resided in the river, including 4 endangered species: clubshell (*Pleurobema clava*), cracking pearlymussel (*Hemistena lata*), dromedary pearlymussel (*Dromus dromas*), and orangefoot pimpleback (*Plethobasus cooperianus*). This conservation project is consistent with the 1973 Endangered Species Act, the goals of the 1916 National Park Service Organic Act, and the national recovery plans for each of these species.

A preliminary research and feasibility study in 2002–2003 provided essential information on host fish requirements for the parasitic larvae of these species, and allowed juveniles to be experimentally produced and cultured in recirculating culture systems at Virginia Tech, to monitor growth and survival of the early life history stage.

Although each female may contain between 1,000 and 100,000 larvae for release to the river and attachment to host fish, research results suggest that fewer than 1% of the larvae attach and transform to the juvenile stage under natural conditions. Hence, artificial propagation can dramatically increase the successful recruitment of juveniles into the populations. During this exploratory stage of the project, more than 42,000 juveniles of four of the endangered species were released to an extensive shoal area of the river, to augment natural reproduction at this site. The release of juveniles two weeks to



Freshwater mussel restoration at Big South Fork involves several partners (top) working to optimize laboratory propagation methods of endangered mussel species, followed by the release of juveniles in the park. In 2004, approximately 12,000 mussels, including the littlewing pearlymussel (bottom), were introduced to park waters.

six months of age bolstered recruitment of naturally produced juveniles in the river.

The laboratory propagation process begins with collection of egg-carrying females from the river. Larvae are removed without harm to the mussels and are induced to attach to the gills of suitable host fish. Female mussels are returned to the river unharmed, to reproduce in subsequent years. The infested host fish are held in tanks at controlled temperatures until the larvae transform from the parasitic larval stage to the free-living juvenile stage. These juveniles are then placed in water recirculating systems with a layer of fine sediment and daily additions of small unicellular algae as their main diet. Once juveniles achieve a size large enough to avoid being consumed by most invertebrate predators in their natal rivers, they are released to fend for themselves and grow to adulthood.

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In FY 2004, this restoration project focused on four of the five endangered species with previously identified host fish. Experiments conducted with juveniles of the Cumberland combshell and littlewing pearlymussel tested various culture conditions to improve their survival within the recirculating aquaculture systems. Survival success can differ greatly among broods, and the causes for this variability continue to be evaluated through the manipulation of culture conditions. During this period, approximately 12,000 juveniles were released to the river upon completion of the culture experiments. Plans for 2005 include additional host fish testing and the production and release of additional endangered juvenile mussels at sites selected by park personnel.

It will take several years to evaluate the success of this recovery project, but the documented success of such releases in other rivers provides confidence that endangered populations of resident species and perhaps extirpated species will one day thrive in this national park unit. ■

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# The prickly price of threatened and endangered cacti

By Dave Worthington and Pete Fonken

**POACHERS COLLECT THE THREATENED** Winkler cactus (*Pediocactus winkleri*) and endangered Wright's fishhook cactus (*Sclerocactus wrightiae*) from park lands and sell them internationally over the Internet. These federally listed plants are small (about the size of a 50-cent piece) and in spring have attractive, colorful blooms, making them popular for planting in personal rock gardens. Web sites offer individual plants of these two species for \$10 and packets of 10 seeds for about \$2. These prices are high enough to make collection profitable but low enough to ensure continued demand.

Illegal collecting of these sensitive cactus species occurs in Capitol Reef National Park—Utah's second largest national park. Situated on the Colorado Plateau roughly halfway between Zion and Arches National Parks in south-central Utah, Capitol Reef is 70 miles (113 km) long and, though only 13 miles (21 km) across at its widest point, encompasses 378 square miles (979 km<sup>2</sup>) of remote and rugged topography. In addition the park's perimeter measures nearly 200 miles (322 km), intersecting many backcountry roads and multiple entrances and making protection of sensitive resources challenging.

Through the Natural Resources Protection Fund, the NPS Biological Resource Management Division funded a three-year project at Capitol Reef to test surveillance products for detecting illegal collection of these cacti. Many parks use similar technology to

protect resources, such as intrusion-detection systems in historical buildings and remote sensors to detect people entering an archaeological site. At Capitol Reef, however, staff faced an additional challenge: scattered, remote locations. Most off-the-shelf products are not appropriate for installation in isolated areas where response times are measured in hours or days. This situation required technology that could record events for later review, securely notify personnel when an event occurred, and remain unattended for long periods.

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Staff members of the Division of Resource Management and Science and the Division of Visitor and Resource Protection sought the assistance of personnel from three agencies as they developed surveillance techniques. Technicians and law enforcement personnel from the USDA Forest Service combined tried-and-true equipment with new technologies, including Web-based and satellite systems. A special agent with the National Park Service helped test and deploy equipment, and a U.S. Fish and Wildlife Service special agent ensured that the selected techniques would be legally valid under the Endangered Species Act of 1973 and Lacey Act Amendments of 1981, which are used to prosecute poaching.

In the second year of this project and the first year of field-testing equipment, park staff has learned that it is not possible to schedule too much time to test, place, and check equipment. That is, equipment can break, and resoldering a broken wire may require a two-hour trip. A long drive may result in the discovery that a suspected cactus poacher is really a rabbit or a cow. Nevertheless, park staff is excited by the potential that this cutting-edge technology possesses. Having figured out most of the quirks and system



Winkler cactus (*Pediocactus winkleri*), a plant federally listed as threatened, is illegally collected from federal lands in and near Capitol Reef National Park in southern Utah.

Staff members at Capitol Reef National Park have spent countless hours installing, testing, checking, and repairing surveillance equipment in the field.







The open, sparsely vegetated habitat of the cacti makes installation of surveillance equipment challenging.

limitations and how to remotely differentiate between a thunderstorm and a passing vehicle, employees at Capitol Reef are optimistic that the systems deployed in the field will work effectively. In addition, because plants and animals cross administrative boundaries, park managers are developing a memorandum of understanding with the Bureau of Land Management and USDA Forest Service that will allow law enforcement personnel to work across boundaries to enforce resource laws. Staff at Capitol Reef believe that in cooperation with these other agencies, the techniques and lessons learned thus far will help lead to apprehension of plant poachers and be useful to other managers caring for threatened and endangered resources in remote areas. ■

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## Yellowstone sand verbenas: A one-of-a-kind plant

*By Jennifer Whipple*

Yellowstone sand verbenas (*Abronia ammophila*), an endemic species with a narrow distribution along the shoreline of Yellowstone Lake, is the rarest of Yellowstone plants. In 1990 only one known location for this species had been documented. In the summers of 1995, 1998, and 1999, however, surveyors found three new locations (and counted the total population of plants at about 8,000). With such a small isolated population of plants, two critical questions emerged during these surveys: What are the pollinators of Yellowstone sand verbenas, and what is its reproductive strategy? Matching grants from Canon U.S.A., Inc., and the National Fish and Wildlife Foundation enabled park managers to contract Dr. Sedonia Sipes of Southern Illinois University–Carbondale to answer these questions. Dr. Sipes and graduate student Liz Saunders performed fieldwork in 2003 and 2004 and completed the final report in fall 2004.

This study indicates that *Abronia ammophila* exhibits a number of fortuitous traits that may assist in its persistence. First, *A. ammophila* is self-compatible (i.e., it employs self-pollination among its reproductive strategies). Second, it seems to suffer no significant inbreeding depression resulting from self-pollination and pollination by near-neighbors. It also seems to enjoy a long reproductive season with high reproductive output and low, but apparently adequate, numbers of potential pollinators, including noctuid and sphingid moths, and possibly butterflies and bumblebees.



Many questions remain about the life history of Yellowstone sand verbenas, for example the average life span of the plant, its demographic trends, the relationships of this taxon with close relatives, and how much visitor disturbance (i.e., trampling) the plants can tolerate before being extirpated from an area. Nevertheless, the knowledge gained through this recent study is an excellent start for ensuring the survival of this one-of-a-kind plant. ■

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# Swimming upstream: Endangered fishes in the Colorado River struggle to survive

By Melissa Trammell



The National Park Service is a partner in the Upper Colorado River Endangered Fish Recovery Program, a multistakeholder effort to recover four endangered fishes while allowing water development to continue. Several park units in the NPS Intermountain Region are within the recovery program management area, including Dinosaur National Monument and Glen Canyon National Recreation Area. In 2004, NPS staff expanded efforts to control invasive fish within this area.

Home to four federally listed endangered fish species, the upper Colorado River basin is being managed cooperatively to reduce competition by nonnative fishes. Efforts to improve conditions for native fish in 2004 included removing nonnative species through electrofishing (above), moving nonnative game fish such as smallmouth bass to ponds and reservoirs and tagging them to study their ability to return to the river (below left), and documenting endangered species such as pikeminnow (below right).



**"SWIMMING UPSTREAM"** is a phrase used by the Upper Colorado River Endangered Fish Recovery Program to underscore the struggle that endangered fish endure to survive in the Colorado River, which is both overallocated and teeming with nonnative competitors. The National Park Service is a member of the recovery program, a multistakeholder partnership dedicated to recovering four endangered fishes while allowing water development in the Colorado River basin to continue. The program works to recover the Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*), and bonytail (*Gila elegans*). As a program partner, the National Park Service greatly expanded efforts to control and manage invasive nonnative fish in the upper Colorado River basin in 2004.

In the upper river basin, more than 40 introduced species of fish compete with 12 native species, four of which are federally listed as endangered. Nonnative fish can be both predators (usually game fish) and competitors for food and habitat. The Yampa River, a tributary to the Green River in Dinosaur National Monument, was previously considered relatively pristine and unimpaired by water development and nonnative species. However, it suffered a severe blow in the early 1990s when a reservoir on a tributary stream was nearly emptied on

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an emergency basis, releasing nonnative northern pike (*Esox lucius*) and smallmouth bass (*Micropterus dolomieu*) into the river. The released invasive fish quickly established thriving populations in the river, and their numbers have exploded in recent years, helped by the current five-year drought. Both northern pike and smallmouth bass have expanded their range downstream into Dinosaur National Monument.

Concerns about the impacts of nonnative fish on the Colorado pikeminnow and humpback chub, the two endangered fish presently found in the Yampa River, led to expanded control efforts in and upriver from Dinosaur National Monument in 2004. Channel catfish (*Ictalurus punctatus*) and smallmouth bass were the main targets for removal in the monument. Experimental removal of catfish has been going on since 1998, and though these efforts have not resulted in reduced numbers of catfish, the average size of the fish has decreased as the larger adults are removed. This is desirable because smaller fish are less effective predators and produce fewer young. Control of smallmouth bass began in 2004 and resulted in the removal of approximately 20% of its population this year. Northern pike were removed upstream of the park in 2003 and 2004. The early 2004

results are encouraging and suggest that up to 50% of adult northern pike can be removed in a single year.

In 2004, expanded control efforts in and upriver from Dinosaur National Monument led local anglers to oppose removal activities because of a perceived loss of game fish and angling opportunities, including guided fishing trips. To address these concerns a cooperative solution was developed with the Colorado Division of Wildlife to

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live-capture game fish and move them into local ponds and reservoirs. This solution allows anglers to continue to enjoy fishing for the nonnative fish; however, confining these fish to ponds lessens the risk posed to endangered fish. The risk of translocated fish returning to the river and again becoming a problem for native fish will be assessed, and based upon the findings, this solution may have to be reevaluated in the future.

The San Juan River Basin Recovery Implementation Program also has been removing channel catfish and other nonnative fish for several years in that river in and above Glen Canyon National Recreation Area. As in Dinosaur, no overall reduction in numbers has been seen, but there has been a shift toward smaller fish.

A final measure of successful removal would be an increase in native and endangered fish, which has not yet occurred. Where challenges facing park resources transcend park boundaries, as is the case for the native fish of the Colorado River, partnerships are perhaps the only strategy for safeguarding the natural heritage found in our national parks. With this in mind, the National Park Service and the recovery program are dedicated to working together to improve the opportunities for native and endangered fish to survive. ■

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#### NPSFACT

The bald eagle has made a magnificent recovery since the era when prevalent pesticides led to eggshell thinning and its listing as one of the first threatened species more than 30 years ago. Though this American symbol is still classified as threatened, the U.S. Fish and Wildlife Service is considering delisting the species. **Bald eagles are found in 125 national parks**, the greatest number of parks for the occurrence of any federally listed species.

## Despite hurricanes, coastal national parks offer hope of survival for sea turtles

By Cliff McCreedy

At 29 sites within the National Park System, threatened or endangered nesting sea turtles find a rare haven on undeveloped beaches. National Park Service biologists, seasonal workers, and volunteers actively monitor and protect sea turtle nests, cooperate with local stranding networks, and conduct tagging programs to track nesting sea turtles. In 2004, however, turtle nesting numbers declined in many coastal national parks as a result of hurricanes.

The severe storms inflicted substantial damage to beach habitats at Gulf Islands National Seashore in Florida and Mississippi, flooding or washing away nests and reducing sea turtle reproduction rates. At Florida's Canaveral National Seashore, Resource Management Specialist John Stiner reported 2,508 sea turtle nests, the lowest total since 1988, including 2,281 loggerheads (*Caretta caretta*), 255 green sea turtles (*Chelonia mydas*), and 6 leatherbacks (*Dermochelys*



A female hawksbill sea turtle covers her nest after depositing eggs on the beach in Buck Island Reef National Monument.

*coriacea*). Although the first 1,000 nests produced hatchlings, more than half of the nests had not yet hatched when Hurricane Frances struck the national seashore in late August, and the handful that remained were destroyed by Hurricane Jeanne about a month later. Jeff Cordes, resource management specialist, said that Cape Lookout National Seashore in North Carolina also experienced the fewest number of nests since 1988, where a total of 74 loggerhead nests and 3 leatherback nests were found. Seven nests washed away during Hurricane Alex in early August and 30 other nests were flooded by Alex or other storms and failed to hatch.

However, nesting rates increased at Buck Island Reef National Monument in the Virgin Islands. Typically the park records 20 to 40 nesting hawksbills (*Eretmochelys imbricata*), reports Chief of Resources Zandy Hillis-Starr. In 2004, though, 52 nesting hawksbills, along with 9 greens, several leatherbacks, and 1 loggerhead, were observed. In 2003 the park documented the nesting of a hawksbill first tagged as a juvenile in the coral reef surrounding Buck Island seven years ago. Additionally, Padre Island National Seashore in Texas experienced a record-setting year for Kemp's ridley sea turtles (see article, page 55).

Despite impacts from a troublesome 2004 hurricane season, many coastal national park sites continue to serve as critical nesting grounds for sea turtles. ■

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# Yellowstone wolf found near Denver

By Alice Wondrak Biel and Douglas W. Smith



The experience of wolf F293 (not shown here) demonstrates that human challenges will be the major barrier to wolves becoming reestablished across the Rocky Mountains.

**IN JUNE 2004, YELLOWSTONE WOLF F293**, a two-year-old female, was found dead along Interstate 70 near Denver, Colorado. Wolf F293 originated from the Swan Lake Pack, whose territory includes the Mammoth Hot Springs area, in Yellowstone's northwest corner; she was last located in Yellowstone in January 2004. Investigators estimated that F293 traveled 300–400 miles (483–644 km) of straight-line distance. Because wolves usually travel in random patterns rather than in straight lines, however, she may have covered twice or as much as four times that distance before she was killed.

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*Finding vacant territory in Yellowstone in which to start a new pack is getting more difficult for a dispersing wolf.*

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At the time she was found, rumors circulated that F293 actually had been killed elsewhere and was then dumped along the highway, which has been known to happen in the past. However, investigations by the U.S. Fish and Wildlife Service have shown that such is probably not the case here. Rather, wolf F293 traveled to Colorado on her own and was killed when she was hit by a car.

Wolf F293's journey may have begun because finding vacant territory in Yellowstone in which to start a new pack is getting more difficult for a dispersing wolf. With 175 wolves in 15 packs, the Yellowstone wolf restoration program is meeting all expectations, and Yellowstone National Park probably is approaching its carrying

capacity for wolves. Wolf F293 could likely have remained in Yellowstone if she had been willing to settle in a poor habitat area, but instead she moved on.

Also noteworthy is that large-scale moves such as this are characteristic of young wolves of either sex; the record straight-line wolf dispersal is 600 miles (965 km). Not much genetic segregation occurs in wolves for this reason; because they are such good travelers, they intermix. What makes F293's dispersal remarkable is that she achieved it in the lower 48 states, where significant barriers to such movement—such as large interstate highways and humans prone to shooting them—exist.

The discovery of wolf F293 in the Denver area indicates that the existence of other wolves between Yellowstone and central Colorado is not very likely. Because wolves are extremely good at finding other wolves, if F293 had found a male mate, she would have stopped instead of continuing to travel. Although F293's dispersal resulted in death, other wolves from the northern Rocky Mountains restoration are starting to establish territories in surrounding states. Whether they will persist outside protected lands depends on the management plans being developed by states in conjunction with the U.S. Fish and Wildlife Service. ■

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## Timucuan partners with Jacksonville University to protect gopher tortoises

By Shauna Ray Allen and Ken Hoover

The gopher tortoise (*Gopherus polyphemus*) is a species of special concern in Florida, where its status will be elevated to "threatened" if a recent proposal is accepted. It is a keystone species, providing refuge through its burrows to a variety of other organisms, and is thus an indicator species of ecosystem health. Existing tortoise populations in the Timucuan Ecological and Historic Preserve are small and widely separated. Ideal gopher tortoise habitat is a pine savannah of widely spaced trees with an understory dominated by wiregrass, legumes, shrubs, and other herbaceous vegetation on which the tortoises feed. This habitat requires sunlight for the growth of these food species. In the past this landscape would be burned naturally on an average cycle of 7 to 10 years by lightning strikes brought by summer thunderstorms, preserving the open canopy. However, the Timucuan Preserve is near areas of human residential development where fire is controlled and prescribed burning cannot be practiced.



Several mature gopher tortoises have colonized the sand hill habitat within the headquarters complex of the Timucuan Preserve. Prescribed fire, which would help maintain an open canopy, is excluded in this area because of the densely populated human neighborhoods nearby.

To protect gopher tortoises within the constraints of a landscape shared with humans, the preserve undertook a project to identify and classify areas suitable for gopher tortoise habitat and to recommend management practices in these areas that will promote viability of existing tortoise populations. The project was conducted from September 2002 through May 2004 with Dr. Ken Hoover, professor of biology at Jacksonville University, under a cooperative agreement with

the Southern Appalachian Cooperative Ecosystem Studies Unit. The fieldwork began in April 2003 and was completed in September of that year.

The project findings were based on field surveys of known and potential habitat, which were classified based on established criteria. The survey also included vegetation sampling and statistical analysis to determine the most important vegetation species in occupied habitat. Preserve resource management staff provided GIS and GPS training and technical assistance for the fieldwork. In the course of its research, the project created a bibliography of 178 references on gopher tortoises.

The project determined that under current conditions, the longleaf pine sand hills are succeeding to oak-hickory hardwood forests or scrub oak-dominated communities. Sunlight penetration through these heavily canopied areas is greatly reduced, affecting herbaceous species needed by gopher tortoises.

Recommendations for good management of the gopher tortoise include mechanically removing trees, selectively planting food species, and creating corridors to link isolated populations and help promote genetic variability. Other suggestions are relocating isolated tortoises from weedy, disturbed habitats to populations in areas that are being managed, and protecting gophers and burrows from human and domestic animal intrusion. The project recognizes the possibility of increasing Jacksonville community involvement; volunteers might provide labor necessary to implement each of the management steps to preserve habitat areas. Recommended management actions will be incorporated into the preserve's resource management plan in the hope that the gopher tortoises will thrive. ■

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## Record-breaking nesting year for Kemp's ridley sea turtles

By Donna J. Shaver



The year 2004 marks an endangered species success story in the making. The story began in 1978 with the initiation of an international, multiagency, experimental project to reestablish a nesting colony of endangered Kemp's ridley sea turtles (*Lepidochelys kempii*) at Padre Island National Seashore. Today Padre Island conducts a program to detect and protect Kemp's ridley nests through patrols, public education, and community involvement. Thanks to funding from the Natural Resource Challenge, Department of the Interior Cooperative Conservation Initiative, Texas Parks and Wildlife Department, and other partners, a record 42 Kemp's ridley nests were found on the Texas coast in 2004, including 22 at Padre Island

National Seashore. Eggs from 32 of the 42 nests were transported to the Padre Island incubation facility for protected care, and the 2,608 hatchlings produced were released at the park this year.

More Kemp's ridley nests have been recorded at Padre Island National Seashore than at any other location in the United States. Overall, the number of nests found on the Texas coast has increased over the last decade (1995, 4 nests; 1996, 6 nests; 1997, 9 nests; 1998, 13 nests; 1999, 16 nests; 2000, 12 nests; 2001, 8 nests; 2002, 38 nests; 2003, 19 nests; 2004, 42 nests). Much remains to be done in this long-term restoration effort, but findings in recent years are encouraging. With continued effort it is likely the Kemp's ridley will be downlisted to threatened status and a secondary nesting colony of this native species will become established at Padre Island National Seashore. ■

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## Recovering the Mohave tui chub

By John Wullschleger, Debra Hughson, and Danette Woo

The Mohave tui chub (*Siphateles bicolor mohavensis*) evolved as the only native fish in the Mojave River system during the Pleistocene Epoch, a period when the river flowed into three large lakes in the heart of the present-day Mojave Desert. This fish is one of several subspecies that descended from a common ancestor that occupied intermittently connected Pleistocene lakes covering much of the western United States. Speciation began as the lakes receded, isolating populations in separate basins.

In the early 20th century, dams and diversions in the Mojave River watershed began to modify natural flow regimes and alter riverine habitat; these activities were the primary cause for the decline of the Mohave tui chub. Introduced species, particularly the arroyo chub, also hastened its demise. By 1970 the Mohave tui chub seemed to have been extirpated from the Mojave River and was federally listed as endangered. Fortunately, a relict population persisted in an isolated spring on the edge of Soda Lake playa, near the river's terminus. In 1984 the recovery plan called for the establishment of six self-sustaining populations for downlisting and three additional populations in the river for delisting. Although fish from the Soda Springs site were used to establish populations both inside and outside the Mojave River basin, most of these populations failed.

In an effort to reinvigorate recovery efforts, Mojave National Preserve, California, hosted a workshop in September 2003. Participants representing multiple agencies reviewed the 1984 recovery plan and determined that securing the species would require more than the six populations necessary for downlisting; they also identified potential sites for new populations. Participants discussed emerging threats and made recommendations for research to better quantify and reduce or eliminate these threats. Participants also recognized the need for an active public education program that would build support for recovery.

Human population growth and increased water demand in the Mojave River drainage may make delisting the Mohave tui chub impossible. However, the renewed interest generated by the workshop already has had positive results. For example, studies of the effects of the Asian tape worm and the ecology and population dynamics in lakes have been funded. In addition, a Safe Harbor Agreement with the Lewis Center for Educational Research may allow reintroduction of Mohave tui chub into a section of the Mojave River. If this proves feasible, it will constitute the first attempt to reestablish the species within its native range. ■

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Sampling allows biologists to assess the status and trend of populations of the Mohave tui chub in Lake Tuendae, an artificial pond that is now home to the federally listed endangered fish species. Located in Mojave National Preserve, Lake Tuendae lies on the edge of the Soda Lake playa.



## Piping plover making a comeback

By Kimberly Struthers

Piping plover (*Charadrius melodus*), a federally endangered Great Lakes shorebird, is making a comeback through the teamwork of a multiagency recovery effort. The number of breeding pairs of plovers within the Great Lakes reached an all-time high of 55 during the 2004 breeding season. This number included 19 pairs of plovers that nested at popular recreational beaches in Sleeping Bear Dunes National Lakeshore (Michigan). Recovery efforts helped the birds



nesting within the park to fledge a record number of chicks, 38% (36 of 93) of the entire Great Lakes fledglings, despite an exceptionally wet season that threatened to destroy some of the nests.

Great Lakes-wide plover conservation management practices included establishing perimeter fencing around nesting areas to allow birds to incubate without disturbance, erecting exclosures around full clutches to protect eggs from depredation, and collecting abandoned eggs for captive rearing. Park staff and volunteers conducted daily plover patrols to ensure that adults and chicks were accounted for. They also informed visitors about the park's plover conservation program and helped them view the birds through spotting scopes.

Park staff continued a predator control program at Dimmick's Point on North Manitou Island, which helped to fledge the highest number of chicks (18) at any nesting location within the Great Lakes. The predator control program was jointly funded by the Cooperative Conservation Initiative of the Department of the Interior, the NPS Natural Resource Preservation Program, and the U.S. Fish and Wildlife Service.

Partnership is the hallmark of the recovery effort for the piping plover and a critical component of recent success. In 2004, because of the conservation efforts of several agencies, the Great Lakes piping plovers are a third of the way to reaching the recovery goal of 150 pairs, which is a milestone worth celebrating. ■

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Park staff manually raises a piping plover nest to protect it from storm surge at Sleeping Bear Dunes National Lakeshore, one of several resource management measures that are aiding the comeback of the federally listed endangered bird species.

## Wildlife ecologist receives Director's Award



Pinnacles National Monument, California, protects the remains of an ancient volcano. The park's spires, sheer-walled canyons, and talus passages stand as evidence of millions of years of erosion and faulting. Today Pinnacles is also known as a haven for rare wildlife, thanks in part to the commitment

of NPS Wildlife Ecologist Amy Fesnock. Given the Director's Award for Professional Excellence in Natural Resources, Amy worked hard to secure a brighter future for three rare species at the monument: California condor (*Gymnogyps californianus*), California red-legged frog (*Rana aurora draytonii*), and Townsend's big-eared bat (*Corynorhinus townsendii*).

Her most impressive accomplishment was getting the monument selected as the newest release site for endangered California condors and securing three years' worth of project funding. By late 2004, five free-flying California condors were making their home at the monument. One could argue that Amy's efforts on behalf of the condor were reason enough for an award, but she did not stop there. Concurrently, Amy launched an effort to bolster the monument's population of California red-legged frogs, a federally listed threatened species, developing an experimental recovery program that restored frogs to the Bear Gulch Reservoir. The project more than doubled the monument's population of frogs and protected them from invasive green sunfish. Thanks to Amy's efforts to develop a cave management plan, Townsend's big-eared bats, a species of special concern in California that was unexpectedly found in the park, are managed both to protect the species and to allow the public to enjoy the popular caves the bats use as roosts.

Amy was motivated to focus on these three rare species because findings from the Inventory and Monitoring program showed that these three animals were critical parts of the park ecosystem that were missing or likely to become so. "In the case of the California red-legged frog and Townsend's bat, some of the motivation was to make sure these species were not lost on my watch, which I think many park managers can understand," notes Amy. "And condors, condors are just cool."

"One person cannot do great things alone," says Amy. "Great things require the right environment, including support from upper management and the willingness to do the right thing, even if it is hard." Amy credits park Superintendent Cicely Muldoon and Chief of Resource Management Tom Leatherman for encouraging her to set the bar high and achieve difficult goals. ■

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